CLAIMS

What is claimed is:

1. Positioning arm for use in reducing baggage stream width for a stream of baggage items, the positioning arm comprising a vertical belt with bi-directional vertical belt drive means and control input means.

2. Positioning arm as recited in claim 1 further comprising positioning arm impact sensing means.

3. Positioning arm as recited in claim 2 wherein the positioning arm impact sensing means comprises a spring loaded vertical slide and one or more pressure sensors.

4. Positioning arm as recited in claim 1 further comprising arm pivot means.

5. Positioning arm as recited in claim 4 wherein the arm pivot means comprises an upstream pivot shaft and a pivot mechanism.

6. Positioning arm as recited in claim 5 wherein the pivot mechanism comprises a pivot motor, pivot drive, pivot cam, central push rod, lateral push rod, central slide track, central pivot slide slidably mounted on the central slide track, lateral slide track, lateral slide slidably mounted on the lateral slide track, and pivot joints connecting the pivot cam to the central push rod, the central push rod to the central slide, the central slide to the lateral push rod and the lateral push rod to the lateral slide, the pivot mechanism being anchored to the support frame and the positioning arm being connected to the lateral slide by an arm support member.

7. Positioning arm as recited in claim 1 wherein the bi-directional vertical belt drive means comprises bi-directional vertical belt variable speed drive means.

8. Positioning arm as recited in claim 1 wherein the bi-directional vertical belt drive means incorporates a variable frequency drive.

9. Baggage positioner for reduction of baggage stream width for a baggage stream on a conveyor belt comprising:

a) pair of positioning arms, each positioning arm having an infeed end and a discharge end, each positioning arm having a vertical belt with bi-directional vertical belt drive means, the infeed end of the respective positioning arms being positioned on opposing sides of the conveyor belt, and the separation of the discharge ends of the respective positioning arms being determined based on the desired baggage stream width reduction; and

b) control input means.

10. Baggage positioner as recited in claim 9 further comprising a positioning arm controller.

11. Baggage positioner as recited in Claim 9 further comprising positioning arm impact sensing means.

12. Baggage positioner as recited in Claim 11 wherein the positioning arm impact sensing means comprises a spring loaded vertical slide and one or more pressure sensors in each positioning arm.

13. Baggage positioner as recited in claim 9 further comprising a position sensor.

14. Baggage positioner as recited in Claim 13 wherein the baggage positioner has an infeed end and the position sensor is positioned more or less at the infeed end.

15. Baggage positioner as recited in Claim 13 wherein the position sensor comprises one or more vertical position sensors positioned above the baggage stream.

16. Baggage positioner as recited in Claim 15 wherein the position sensor further comprises one or more lateral position sensors.

17. Baggage positioner as recited in Claim 15 wherein the vertical position sensors are photo sensors.

18. Baggage positioner as recited in Claim 13 wherein the position sensor is a photo array light curtain.

19. Baggage positioner as recited in Claim 13 wherein the position sensor is a laser volume measurement system.

20. Baggage positioner as recited in Claim 13 wherein the position sensor is an ultrasonic volume measuring system.

21. Baggage positioner as recited in Claim 9 further comprising arm pivot means for pivoting each of the positioning arms about a respective infeed end pivot axis, thereby providing for varying the separation of the discharge ends of the positioning arms.

22. Baggage positioner as recited in Claim 21 wherein the arm pivot means comprises an upstream pivot shaft and a pivot mechanism.

23. Baggage positioner as recited in Claim 22 wherein the pivot mechanism comprises a pivot motor, pivot drive, pivot cam, central push rod, pair of opposing lateral push rods, central slide track, central pivot slide slidably mounted to the central slide track, pair of opposing lateral slide tracks, pair of opposing lateral slides with a respective lateral slide being slidably mounted to a respective lateral slide track, and pivot joints connecting the pivot cam to the central push rod, the central push rod to the central slide, the central slide to the lateral push rods respectively and the lateral push rods respectively to the lateral slides, the pivot mechanism being anchored to the support frame and each positioning arm being connected to a respective lateral slide by a respective arm support member.

24. Baggage positioner as recited in Claim 9 further comprising horizontal belt movement monitor means for the conveyor belt.

25. Baggage positioner as recited in Claim 24 wherein the horizontal belt movement monitor means comprises a horizontal belt movement monitor sensor.

26. Baggage positioner as recited in Claim 24 wherein the horizontal belt movement monitor means comprises an infeed end optical encoder coupled to a drum shaft of the conveyor belt.

27. Baggage positioner as recited in Claim 24 wherein the horizontal belt movement monitor means comprises a proximity sensor keyed to the sprocket of a drum shaft of the conveyor belt.

28. Baggage positioner as recited in Claim 24 wherein the horizontal belt movement monitor means comprises a tachometer.

29. Baggage positioner as recited in Claim 9 further comprising leading edge sensing means.

30. Baggage positioner as recited in Claim 29 wherein the leading edge sensing means comprises one or more leading edge sensors.

31. Baggage positioner as recited in Claim 30 wherein the leading edge sensors comprise leading edge photo sensors.

32. Baggage positioner as recited in Claim 9 further comprising discharge sensing means for sensing the leading and trailing edge of a baggage item as it exits the baggage positioner, thereby providing baggage clear confirmation and baggage jam alert data to the control input means.

33. Baggage positioner as recited in Claim 32 wherein the discharge sensing means comprises one or more discharge sensors.

34. Baggage positioner as recited in Claim 33 wherein the discharge sensors comprise discharge photo sensors.

35. Baggage positioner as recited in Claim 11 wherein the positioning arm impact sensing means comprises one or more pressure sensors in each positioning arm.

36. Baggage positioner as recited in Claim 9 wherein the bi-directional vertical belt drive means for each of the positioning arms comprises bi-directional vertical belt variable speed drive means.

37. Baggage positioner as recited in Claim 9 wherein the bi-directional vertical belt drive means for each of the positioning arms incorporates a variable frequency drive.

38. Baggage positioner for reduction of baggage stream width for a stream of baggage items from a conveyor belt comprising:

a) horizontal conveyor having an infeed end and a discharge end;

b) pair of positioning arms, each positioning arm having an infeed end and a discharge end, each positioning arm having a vertical belt with bi-directional vertical belt drive means, the infeed end of the respective positioning arms being positioned on opposing sides of the horizontal conveyor, and the separation of the discharge ends of the respective positioning arms being determined based on the desired baggage stream width reduction;

c) support structure for horizontal conveyor and positioning arms; and

d) control input means.

39. Baggage positioner as recited in claim 38 further comprising a position sensor.

40. Baggage positioner as recited in claim 38 further comprising a positioning arm controller.

41. Baggage positioner as recited in Claim 38 further comprising positioning arm impact sensing means.

42. Baggage positioner as recited in Claim 41 wherein the positioning arm impact sensing means comprises a spring loaded vertical slide and one or more pressure sensors in each positioning arm.

43. Baggage positioner as recited in Claim 39 wherein the baggage positioner has an infeed end and the position sensor is positioned more or less at the infeed end.

44. Baggage positioner as recited in Claim 39 wherein the position sensor comprises one or more vertical position sensors positioned above the baggage stream.

45. Baggage positioner as recited in Claim 44 wherein the position sensor further comprises one or more lateral position sensors.

46. Baggage positioner as recited in Claim 44 wherein the vertical position sensors are photo sensors.

47. Baggage positioner as recited in Claim 39 wherein the position sensor is a photo array light curtain.

48. Baggage positioner as recited in Claim 39 wherein the position sensor is a laser volume measurement system.

49. Baggage positioner as recited in Claim 39 wherein the position sensor is an ultrasonic volume measuring system.

50. Baggage positioner as recited in Claim 40 further comprising arm pivot means for pivoting each of the positioning arms about a respective infeed end pivot axis, thereby providing for varying the separation of the discharge ends of the positioning arms.

51. Baggage positioner as recited in Claim 50 wherein the arm pivot means comprises an upstream pivot shaft and a pivot mechanism.

52. Baggage positioner as recited in Claim 51 wherein the pivot mechanism comprises a pivot motor, pivot drive, pivot cam, central push rod, pair of opposing lateral push rods, central slide track, central pivot slide slidably mounted to the central slide track, pair of opposing lateral slide tracks, pair of opposing lateral slides with a respective lateral slide being slidably mounted to a respective lateral slide track, and pivot joints connecting the pivot cam to the central push rod, the central push rod to the central slide, the central slide to the lateral push rods respectively and the lateral push rods respectively to the lateral slides, the pivot mechanism being anchored to the support frame and each positioning arm being connected to a respective lateral slide by a respective arm support member.

53. Baggage positioner as recited in Claim 38 further comprising horizontal belt movement monitor means.

54. Baggage positioner as recited in Claim 53 wherein the horizontal belt movement monitor means comprises a horizontal belt movement monitor sensor.

55. Baggage positioner as recited in 53 wherein the horizontal conveyor has an infeed end drum shaft and the horizontal belt movement monitor means comprises an infeed end optical encoder coupled to the infeed end drum shaft.

56. Baggage positioner as recited in Claim 53 wherein the horizontal conveyor has an infeed end drum with a shaft and a sprocket and the horizontal belt movement monitor means comprises a proximity sensor keyed to the sprocket.

57. Baggage positioner as recited in Claim 53 wherein the horizontal belt movement monitor means comprises a tachometer.

58. Baggage positioner as recited in Claim 38 further comprising leading edge sensing means.

59. Baggage positioner as recited in Claim 58 wherein the leading edge sensing means comprises one or more leading edge sensors.

60. Baggage positioner as recited in Claim 59 wherein the leading edge sensors comprise leading edge photo sensors.

61. Baggage positioner as recited in Claim 38 further comprising discharge sensing means for sensing the leading and trailing edge of a baggage item as it exits the baggage positioner, thereby providing baggage clear confirmation and baggage jam alert data to the control input means.

62. Baggage positioner as recited in Claim 61 wherein the discharge sensing means comprises one or more discharge sensors.

63. Baggage positioner as recited in Claim 62 wherein the discharge sensors comprise discharge photo sensors.

64. Baggage positioner as recited in Claim 41 wherein the positioning arm impact sensing means comprises one or more pressure sensors in each positioning arm.

65. Baggage positioner as recited in Claim 38 wherein the bi-directional vertical belt drive means for each of the positioning arms comprises bi-directional vertical belt variable speed drive means.

66. Baggage positioner as recited in Claim 38 wherein the bi-directional vertical belt drive means for each of the positioning arms incorporates a variable frequency drive.

67. Baggage positioner for reduction of baggage stream width for a stream of baggage items from a conveyor belt comprising:

a) position sensor;

b) horizontal conveyor having an infeed end and a discharge end;

c) pair of positioning arms, each positioning arm having an infeed end and a discharge end, each positioning arm having a vertical belt with bi-directional vertical belt drive means, the infeed end of the respective positioning arms being positioned on opposing sides of the horizontal conveyor, and the separation of the discharge ends of the respective positioning arms being determined based on the desired baggage stream width reduction;

d) support structure for horizontal conveyor and positioning arms; and

e) positioning arm controller.

68. Baggage positioner as recited in Claim 67 further comprising positioning arm impact sensing means.

69. Baggage positioner as recited in Claim 68 wherein the positioning arm impact sensing means comprises a spring loaded vertical slide and one or more pressure sensors in each positioning arm.

70. Baggage positioner as recited in Claim 67 wherein the baggage positioner has an infeed end and the position sensor is positioned more or less at the infeed end.

71. Baggage positioner as recited in Claim 67 wherein the position sensor comprises one or more vertical position sensors positioned above the baggage stream.

72. Baggage positioner as recited in Claim 71 wherein the position sensor further comprises one or more lateral position sensors.

73. Baggage positioner as recited in Claim 71 wherein the vertical position sensors are photo sensors.

74. Baggage positioner as recited in Claim 67 wherein the position sensor is a photo array light curtain.

75. Baggage positioner as recited in Claim 67 wherein the position sensor is a laser volume measurement system.

76. Baggage positioner as recited in Claim 67 wherein the position sensor is an ultrasonic volume measuring system.

77. Baggage positioner as recited in Claim 67 further comprising arm pivot means for pivoting each of the positioning arms about a respective infeed end pivot axis, thereby providing for varying the separation of the discharge ends of the positioning arms.

78. Baggage positioner as recited in Claim 77 wherein the arm pivot means comprises an upstream pivot shaft and a pivot mechanism.

79. Baggage positioner as recited in Claim 78 wherein the pivot mechanism comprises a pivot motor, pivot drive, pivot cam, central push rod, pair of opposing lateral push rods, central slide track, central pivot slide slidably mounted to the central slide track, pair of opposing lateral slide tracks, pair of opposing lateral slides with a respective lateral slide being slidably mounted to a respective lateral slide track, and pivot joints connecting the pivot cam to the central push rod, the central push rod to the central slide, the central slide to the lateral push rods respectively and the lateral push rods respectively to the lateral slides, the pivot mechanism being anchored to the support frame and each positioning arm being connected to a respective lateral slide by a respective arm support member.

80. Baggage positioner as recited in Claim 67 further comprising horizontal belt movement monitor means.

81. Baggage positioner as recited in Claim 80 wherein the horizontal belt movement monitor means comprises a horizontal belt movement monitor sensor.

82. Baggage positioner as recited in 80 wherein the horizontal conveyor has an infeed end drum shaft and the horizontal belt movement monitor means comprises an infeed end optical encoder coupled to the infeed end drum shaft.

83. Baggage positioner as recited in Claim 80 wherein the horizontal conveyor has an infeed end drum with a shaft and a sprocket and the horizontal belt movement monitor means comprises a proximity sensor keyed to the sprocket.

84. Baggage positioner as recited in Claim 80 wherein the horizontal belt movement monitor means comprises a tachometer.

85. Baggage positioner as recited in Claim 67 further comprising leading edge sensing means.

86. Baggage positioner as recited in Claim 85 wherein the leading edge sensing means comprises one or more leading edge sensors.

87. Baggage positioner as recited in Claim 86 wherein the leading edge sensors comprise leading edge photo sensors.

88. Baggage positioner as recited in Claim 67 further comprising discharge sensing means for sensing the leading and trailing edge of a baggage item as it exits the baggage positioner, thereby providing baggage clear confirmation and baggage jam alert data to the control input means.

89. Baggage positioner as recited in Claim 88 wherein the discharge sensing means comprises one or more discharge sensors.

90. Baggage positioner as recited in Claim 89 wherein the discharge sensors comprise discharge photo sensors.

91. Baggage positioner as recited in Claim 68 wherein the positioning arm impact sensing means comprises one or more pressure sensors in each positioning arm.

92. Baggage positioner as recited in Claim 67 wherein the bi-directional vertical belt drive means for each of the positioning arms comprises bi-directional vertical belt variable speed drive means.

93. Baggage positioner as recited in Claim 67 wherein the bi-directional vertical belt drive means for each of the positioning arms incorporates a variable frequency drive.

94. Baggage positioner for reduction of baggage stream width for a stream of baggage items from a conveyor belt comprising:

a) position sensor;

b) horizontal conveyor having an infeed end and a discharge end;

c) movement monitor sensor;

d) leading edge sensor;

e) pair of positioning arms, each positioning arm having an infeed end and a discharge end, each positioning arm having a vertical belt with bi-directional vertical belt drive means, the infeed end of the respective positioning arms being positioned on opposing sides of the conveyor belt, and the separation of the discharge ends of the respective positioning arms being determined based on the desired baggage stream width reduction;

f) discharge sensor;

g) spring loaded vertical slide and one or more pressure sensors in each positioning arm;

h) support structure;

i) positioning arm controller.

95. Baggage positioner for reduction of baggage stream width for a stream of baggage items from a conveyor belt comprising:

a) position sensing means for sensing the position of baggage items in the baggage steam;

b) horizontal conveyor having an infeed end and a discharge end;

c) pair of positioning arms, each positioning arm having an infeed end and a discharge end, each positioning arm having a vertical belt with bi-directional vertical belt drive means, the infeed end of the respective positioning arms being positioned on opposing sides of the conveyor belt, and the separation of the discharge ends of the respective positioning arms being determined based on the desired baggage stream width reduction; and

d) positioning arm control means.

96. Baggage positioner for reduction of baggage stream width for a stream of baggage items from a conveyor belt comprising:

a) position sensing means for sensing the position of baggage items delivered by the conveyor belt to a location where baggage stream width reduction is needed, the position sensing means generating position data; and

b) repositioning means for repositioning baggage items for baggage stream width reduction using bi-directional vertical belts based upon position data received from the position sensing means.

97. Method for reducing baggage stream width for a stream of baggage items from a conveyor belt comprising:

a) position sensing step of sensing the position of baggage items delivered by the conveyor belt to a location where baggage stream width reduction is desired and generating position data; and

b) repositioning step of repositioning each baggage item as needed for baggage stream width reduction by the use of positioning arms with bi-directional vertical belts, repositioning being based upon the position of the baggage item.

98. Method as recited in claim 97 wherein the position sensing step further comprises sensing the width and height of each baggage item for oversize baggage determination and conveyor feed shutdown.

99. Method as recited in claim 97 wherein the position sensing step further comprises sensing the width and height of each baggage item and wherein the positioning arms have a discharge end and the method further comprises a positioning arm adjustment step for adjusting the separation of the discharge end of the positioning arms based upon the height of the baggage item.

100. Method as recited in claim 97 further comprising a pressure sensing step of sensing any impact of each baggage item with a positioning arm thereby generating pressure data and using the pressure data in the repositioning step.

101. Method as recited in claim 97 further comprising a movement monitor step of monitoring the movement of each baggage item thereby generating baggage movement data and using the baggage movement data in the repositioning step.

102. Method as recited in claim 97 further comprising a leading edge sensing step of sensing the leading edge of each baggage item thereby generating leading edge data and using the leading edge data in the repositioning step.

103. Method as recited in claim 97 further comprising a lateral sensing step of sensing the leading edge and the trailing edge of each baggage item during the repositioning step thereby generating baggage location and length data and using the baggage location and length data in the repositioning step.

104. Method as recited in claim 97 further comprising a discharge sensing step of sensing the passage of each baggage item to the location where baggage stream width reduction is desired thereby generating baggage discharge data and using the baggage discharge data for use in the repositioning step for a successive baggage item.